FIG. 6 is a view like that of FIG. 4, in which the inner stator, in which the inner stator is in its final position mounted on the bearing support tube, and also showing the external rotor; and

FIG. 7 is an enlarged view of detail VII of FIG. 6.

DETAILED DESCRIPTION:

FIG. 1 illustrates a securing ring or disk 20, as used in the present invention for an internal stator 22 (FIGS. 2 & 3) with a lamination stack 23 having four radially extending poles 24, 26, 28, 30. To match these four stator poles, the securing ring has four radially outwardly extending projections 32 and four radially inwardly extending tabs 34. Two poles ~~38,~~ 28, 30 of lamination stack 23 are shown in FIG. 1.

Securing ring 20 preferably comprises ferromagnetic material.

Lamination stack 23 is formed with an internal recess 36 which can be assembled onto a bearing support tube 38, as may be seen by comparing FIG. 4 (partial insertion) with FIG. 6 (full insertion). As shown in FIG. 6, inside the bearing support tube 38, there is supported, on bearings, the central shaft 40 of an external rotor 42 which has permanent magnets 44, which interact in the conventional manner with poles 24 through 30 of inner stator 22. This journalling keeps rotor 42 properly aligned with respect to stator 22.

Usually, these motors are electronically commutated, e.g. with the help of a rotary position sensor or a sensor coil. The mode of operation of such motors, which have been made in quantities of millions of units, is familiar to those skilled in the art, and therefore need not be described here. On the outer surface of rotor 42, fan blades or vanes 43 are preferably provided, and may be integrally formed with the external rotor; see FIG. 6.

As FIG. 2 shows, securing ring or disk 20 is preferably placed on the upper end of lamination stack 23 so that its inner diameter or periphery 48 is substantially aligned with the inner diameter 36 of lamination stack 23 and the tabs 34 extend into the inner recess 36, as best seen in FIGS. 3, 5 & 7. In one exemplary motor, the outer diameter of the

lamination stack 23 was about 22 mm and the diameter of recess 36 was about 10 mm.

Between stator poles 24-30 are located stator slots 50, 52, 54, 56, in which a winding with two phases 58, 60 is wound, whose winding direction and circuit configuration are clearly apparent from FIG. 3 for this exemplary embodiment. The winding ends are connected with three terminals 62, 64, 66 in such a manner that one end of both phases 58, 60 is connected to terminal 64, the other end of phase 60 is connected to terminal 62, and the other end of phase 58 is connected to terminal 66.

In the region of slots 50 to 56, the outer diameter 70 of securing ring 20 preferably matches the adjacent outer diameter 72 (FIG. 1) of lamination stack 23, while in the region of poles 24-30, the radial projections 32 are located, and therefore extend into these poles, improving the cross section of the magnetic circuit in stator 22 and thereby improving the efficiency of the motor.

Lamination stack 23 is surrounded by an insulating coating or covering 76, which also insulates slots 50-56 and thereby serves as a coil former for the winding phases 58, 60. This coating 76 also secures the terminals 62, 64, 66 in an insulated manner with respect to inner stator 22, and it secures securing ring 20 onto the upper end of lamination stack 23; cf. FIG. 2.

Further, coating 76 forms, at the upper end (referring to FIG. 2) of stator 22, a tube-shaped extension 80 with a lower rim 82 whose inner diameter 84 is substantially the same diameter as that of recess 36 of lamination stack 23.

Toward its top, referring to FIG. 2, coating 76 tapers down in its segments 86, 88, 90, 92 (FIG. 3) which, seen in the circumferential direction, are located in respective gaps between tabs 34 of securing ring 20. Further, there extends upward a collar 94, which is a part of the coil former for the phases 58, 60. Phases 58, 60 preferably are so-called bifilary or double-wound windings, i.e. wires 58 and ~~50~~ 60 are wound parallel.